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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/473,103	12/28/1999	ANOOP GHANWANI	2204/150	9599

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EXAMINER	
PRIETO, BEATRIZ	

ART UNIT	PAPER NUMBER
2142	

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/473,103	GHANWANI ET AL.	
	Examiner	Art Unit	
	Prieto Beatriz	2142	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15 and 17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15 and 17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to Amendment filed 02/08/05, claims 1-15, and 17 remain pending.

2. Regarding filed amendment, the claim status of the claims as filed raises uncertainties. For example, claim 2 is labeled "original" yet seems to have been amended, and claim 6 is labeled "original" yet seems to have been amended.

3. The following is a quotation of the second paragraph of 35 U.S.C. §112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

4. Claims 1, 6 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, regarding the added limitation, "a mapping of a first label associated with a last hop forwarding equivalency class (FEC) of the first autonomous system to a second label associated with a first hop in the (FEC) in the second autonomous system". "The (FEC)" recitation seems to refer to "a last hop (FEC) of the first autonomous system", yet it pertains to the second autonomous system.

5. For the purposes of examination claims will be given the broadest reasonable interpretation inlight of the claims as mandated, see MPEP §2111 or 2106. The claimed terms: (i) "*first hop forwarding equivalency class*" will be broadly interpreted as a class address (specs p. 1, lines 25-31), "*border router coupling a first autonomous system to a second autonomous system*" will broadly interpreted as a router that connects a first domain with second domain, where the border router couples the first domain to a second domain via one or more routers outside of the first domain or the border router is also an ingress border router to the second domain to which it is coupled.

Claim Rejection under 35 U.S.C. 102

6. Quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action may be found in previous office action.

7. Claim 17 is rejected under 35 U.S.C. 102(a) as being anticipated by Ericsson, Martin van der Zee, July, pages 1-54 (Zee hereafter).

Regarding claim 17, Zee discloses an information base including an entry correlating a first label (AL1) from a first ("autonomous") system (e.g. A) to a second label (BL1) in a second ("autonomous") system (e.g. B) (see figure 6 and table 3 on pages 31-32). Inter-domain or exterior routing protocols (e.g. BGP and IDRP) are used to exchange routing information between autonomous systems AS (section 3.4 on page 9-10), MPLS uses routing protocol BGP with label swapping paradigm (section 5.1.1). LSR router (Fig. 4 on page 12) contains an label map for mapping an incoming label to an outgoing label. LSR edge routers (Fig. 5) are routers with LSR functionality (page 21);

Zee teaches "storing in a memory at a border router coupling a first autonomous system to a second autonomous system, a mapping of a first label associated with a last hop forwarding equivalency class (FEC) of the first autonomous system to a second label associated with a first hop in the FEC in the second autonomous system". Specifically, storing in tables 2/3 in the memory at a border router (LSR R2 of Figure 6) connecting "coupling" a first autonomous system (IP network B) and a second autonomous system (e.g. IP network A and C) via shown MPLS domain and R1, R4 and R3.

Zee teaches mapping of a first label (e.g. Incoming label BL1) associated with an incoming FEC (B1) originating address (called "last hop Forwarding Equivalency Class FEC") of a first autonomous system (e.g. IP network B) to a second label (e.g. Outgoing Label AL1) associated with outgoing FEC (A1) destination address (called "first hop FEC") in a second autonomous system (e.g. IP network B).

Claim Rejection under 35 U.S.C. 103

8. Quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action may be found in previous office action.

9. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over MPLS Study, Project: Competence Center for ATM Components, Roth et. al., Research Institute of Open Communication Systems, pages 1-42 (referred to as Roth hereafter) in view of Network Working Group Internet Draft (NWGID): A proposed Architecture for MPLS, Rosen, E. et. al., Aug. 1997, pages 1-59 (Rosen hereafter).

Regarding claim 1, Roth discloses with respect to establishing label switched paths,

mapping in a label switching router (LSR) a first incoming label of an protocol message to a second next hop label associated with a next hop (sections 3.1-3.2 on p. 10-12);

swapping at said LSR said first label with a second label in said protocol message (section 3.2 on page 12);

forwarding at said LSR said protocol message to next hop device according to said second next hop label (section 3.1-3.2 on p. 10-12);

receiving at border router (BR) from a first autonomous system a protocol message from a second autonomous system i.e. inter-domain routing between Autonomous Systems via Border Router (BRs) (Fig. 1 on page 5) communicating using an inter-domain routing protocol (e.g. BGP-4);

wherein each router set up its routing table from the exchanged of reachability information using routing protocols (section 2.1 on pages 5-6); however Roth does not explicitly teach where the border router support inter-domain routing protocol for communicating between autonomous systems are label switching capable;

Rosen discloses a protocol architecture for multi-protocol label switching (MPLS) (abstract page 1) including an MPLS edge node as an MPLS node that connects an MPLS domain with a node in a different domain (section 1.2 on pages 5-7, see MPLS egress and ingress domain nodes on section 1.2 on pages 5-7), wherein an MPLS domain is a group of nodes which operate MPLS routing and are one routing or Administrative domain (section 1.2 on pages 5-7), i.e. an "Autonomous System"; labels are based in the forwarding equivalency class (FEC) that a packet is assigned to based on the network layer address, and mapping an outgoing label with an incoming label for packets send from a first LSR to second another, such that the label is the outgoing label for the first LSR (egress) and the incoming label for the second LSR (ingress) (section 2.1 on p. 9-10), incoming labels are mapped to next hop label having an entry in a forwarding map or table (section 2.7-2.7 on p. 12-13 and section 2.12 on p. 16); further wherein Autonomous system are interconnected by means of BGP Border or Edge Routers, (Appendix B on page 55 see MPLS domain and edge node definition on page 6).

It would have been obvious to one ordinary skilled in the art at the time the invention was made that the border router supporting intercommunication between autonomous system discussed in the Roth reference are label switching capable as exemplified by Roth. One ordinary skilled in the art would have been readily apparent of the existing MPLS framework disclosed by Rosen including to use of MPLS egress node which handle traffic as it leaves an MPLS domain and MPS ingress node which handling traffic as it enters an MPLS domain for supporting routing at a first MPLS border (egress) router

associated with a first autonomous system, packets associated with a first label associated therewith to a second MPLS border (ingress) router associated with a second autonomous system associated with a second label associated with traffic entering therein.

Regarding claim 2, mapping, receiving, replacing and forwarding limitations are substantially the same as those disclosed on claim 1, same rationale of rejection is applicable, further

establishing an incoming label switched path associated with a first label over said first autonomous system (Rosen: ingress switched created path or route, where labels are assigned to routes associated with nodes e.g. ingress or egress nose of the label switched path (LSP) see section 2.13 on page 16, associated with an autonomous MLS domain see ingress domain node section 1.2 on pages 5-7);

establishing an outgoing label switched path over said second autonomous system (Rosen: egress switched created path or route, where labels are assigned to routes associated with nodes e.g. ingress or egress nose of the LSP see section 2.13 on page 16 associated with an autonomous MPLS domain see egress domain node section 1.2 on pages 5-7);

learning said second label associated with said downstream neighboring (next hop) device in said second autonomous system (Rosen: downstream nodes inform/distribute to upstream nodes label assignments, see section 2.4 on page 10).

Regarding claim 3, Label Distribution Protocol to setup said outgoing label switched path to a downstream neighboring border device (Rosen: section 2.5 page 11 and section 2.2 on page 32).

Regarding claim 4, establishing a Label Distribution Protocol session with said downstream neighboring (next hop) device to distribute label associated with said downstream neighboring (next hop) device (Rosen: section 2.4-2.5).

Regarding claim 5, creating/maintain in said label information base comprising an entry mapping said first label from said first autonomous system to said second label in said second autonomous system (Roth: sections 3.1-3.2 on p. 10-12).

Regarding claim 6, this apparatus claim comprises the logic operably for performing the method discussed on claim 1, same rationale of rejection is applicable.

Regarding claim 7, this claim comprises limitations substantially the same as those discussed on claims 1-2, same rationale of rejection is applicable.

Regarding claims 8-10, these claims are substantially the same as claims 3-5, respectively, discussed above same rationale of rejection is applicable.

Regarding claim 11, comprising the program product comprising a computer readable medium having embodied therein a computer program for performing the method discussed on claim 1, rejected for obviousness under U.S.C. 103, this same rationale is also applied to computer program product and logic means claims.

Regarding claim 12, comprising the program product for performing the method discussed on claims 1-2, rejected for obviousness under U.S.C. 103, this same rationale is also applied to program product and logic means claims.

Regarding claim 13, substantially the same as claims 8 and 3, rejected for obviousness under U.S.C. 103, this same rationale is also applied to program product and logic means claims.

Regarding claim 14, substantially the same as claims 9 and 4, rejected for obviousness under U.S.C. 103, this same rationale is also applied to program product and logic means claims.

Regarding claim 15, substantially the same as claims 10 and 5, rejected for obviousness under U.S.C. 103, this same rationale is also applied to program product and logic means claims.

Response to Arguments

10. Regarding claim 17, rejected under 35 U.S.C. 102(a) as being anticipated by Zee, it is argued (p. 8 of remarks) that the reference does not disclose or suggest "*a database which maps labels from received at an egress to labels associated at an ingress*", because according to applicant the reference hints the removal of labels and thereby not used across AS boundaries.

Further indicating that the information in the FIB forwards packets within a single MPLS domain and does not include mapping data for "mapping first label from a first autonomous system to a second label in a second autonomous system.

In response to the above-mentioned argument, applicant's interpretation of the prior art has been considered. Table 3 (p. 32) illustrates a Label Information Database (LIB) comprising, e.g. on the table: a FEC (address class) is associated with an Incoming Label mapped to an Outgoing Label,

FEC	**Incoming Label**	Incoming Interface	**Outgoing Label**	Outgoing Interface
A1	BL1	2	AL1	1

the *Incoming Label* (BL1) is mapped to an *Outgoing Label* (AL1);

Specifically, the Incoming Label (BL1) corresponding packet having an destination address "A1" (i.e. a destination address on IP network A having class of service X with an FEC as shown on Table 2), is received through an Incoming Interface "2" from IP network B (i.e. an Outgoing interface "2" is associated with Next Hop R2 for packets destine to IP network B, thereby an Incoming interface "2" is associated with Next Hop R2 for packets originating from IP network B, see table 2) is mapped to an Outgoing Label AL1, to be transmitted through an Outgoing Interface "1" to IP network A (i.e. an Outgoing Interface "1" is associated with Next Hop R1 for packets destine to IP network A see table 2, thereby an Incoming Interface "1" associated with Next Hop R1 for packets originating from IP network A). Communication between nodes is bi-directional see Fig. 5.

Thereby, the reference teaches an where an Incoming Label BL1 received from IP network B through an Incoming Interface 2 (R2) is mapped to an Outgoing Label AL1, for transmission to IP network A through an Outgoing Interface 1 (R1). Arguments that the applied reference does not teach mapping a first label from a first autonomous system to a second label in a second autonomous system have been fully considered but not found persuasive.

11. Regarding claim 17, rejected under 35 U.S.C. 102(a) as being anticipated by Zee, it is argued the reference does not teach claim limitation as amended, specifically, "storing in a memory at a border router coupling a first autonomous system to a second autonomous system, a mapping of a first label associated with a last hop forwarding equivalency class (FEC) of the first autonomous system to a second label associated with a first hop in the FEC in the second autonomous system".

Zee teaches storing (tables 2 and 3) in a memory at a border router (LSR R2 of Figure 6) connecting "coupling" a first autonomous system (IP network B) and a second autonomous system (e.g. IP network A and C) via shown MPLS domain and R1, R4 and R3. Zee teaches mapping of a first label (e.g. Incoming label BL1) associated with an incoming FEC (B1) originating address (called "last hop Forwarding Equivalency Class FEC") of a first autonomous system (e.g. IP network B) to a second label

(e.g. Outgoing Label AL1) associated with outgoing FEC (A1) destination address (called "first hop FEC") in a second autonomous system (e.g. IP network B).

12. Regarding claim 17, rejected under 35 U.S.C. 103(a) as unpatentable over by Rosen, it is argued (p. 12 of remarks) that the reference does not disclose or suggest "distribution of labels across autonomous system", because according to applicant, Rosen describes MPLS within a domain, but not across domain boundaries.

In response to the above-mentioned argument, applicant's interpretation of the prior art are noted. However, Rosen explicitly discusses on Appendix B:

"If label switching router (LSR) R1's next hop for address prefix is LSR R2, and R2 is in a different area or in a *different routing domain than R1*, then R1 may assign and distribute a label for X, even if R2 has not done so. This means that even under egress control, the *border routers in one autonomous system* do not have to wait, before *distributing labels, for any downstream routers* (see upstream/downstream LSRs definition on section 2.2 on p. 11) *which are in other autonomous systems*" see p. 56. Thus, Rosen suggest the distribution of labels across autonomous system boundaries.

13. Applicant's arguments filed 02/08/05 have been fully considered but not found persuasive.

14. In view of the prosecution history of instant application, examiner (although this action has been final) remains open to combine efforts with applicant to find means that would accelerate the prosecution of this application.

Citation of Pertinent Art:

15. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Copies of documents cited will be provided as set forth in MPEP§ 707.05(a):

Evolution Of Multi-protocol Label Switching, Viswanathan, A., et. al., IEEE Communication Magazine, May 1998.

Label Distribution and Forwarding: Network later routing maintains information from common routing protocols, e.g. BGP to determine how packets ought to be routed. This routing information partitions the entire forwarding space into forwarding equivalency classes (FECs). Each FEC is assigned a short, fixed length, locally significant identifier known as "label". As a packet enters an MPLS network,

a conventional layer-three lookup is performed, however, in addition to the conventional next hop, the associated FEC with the assigned label is found. The packet is forward to the next hop with the assigned label. At subsequent nodes, the label is used as an index into a table, which specifies the new outgoing label and the next hop. The old label is replaces with the new, and the packet is forward to the next hop. Information from the routing protocols is used to assign and distribute labels to MPLS peers. In general, an MPLS node receives an "outgoing" label mapping from the peer that is the next hop for a stream, and allocates and distributes "incoming" labels to upstream peers for a given stream. The labels are extended into a switched path through the network as each MPLS nodes "splices" the incoming to outgoing labels. This series of one or more concatenated labels is termed a "label switched path" LSP (right column on p. 167).

Routing Hierarchy and Label Stacking: Consider a network that uses an aggregated LSP to an exit node E (Fig. 2 on p. 168). Ingress nodes A and B send packets on LSP terminating at E. Now E must IP forward the packets destine to different networks shown in the figure (e.g. 12.2, 138.4, and 144.5). Now if E supplies A and B with *a specific label for each of the networks behind it* (e.g. label L2 for destination 128.2), ingress nodes *A and B can stack the appropriate label* before sending packets on the LSP terminating at E. Thus, packets originating at ingress node A have to label encapsulation; the top label is that of the LSP that terminates at E (L1) and the next encapsulation has the label *supplied by E for destination prefix in the packet header (L2 for destination 128.2)*. The packet is switched based on the top level encapsulation (L1). When E receives such packets from LSP terminating at E it pop the top label (L1) and switch the packet based on the next label in the stack (L2). Note that the label (L1) can also be popped by the penultimate router. This, stacking *avoids the need to IP forward the packet at E*. For example, such FEC specific stack labels can be piggybacked in BGP. Ingress LSRs A and B learn about the stack label along the route updates through their peer BGP peering with E.

Thus, the shared common LSP border router E couples a first and second domains (Fig. 2) supplies ingress LSP routers A and B with a specific label for each of the domain networks behind it (e.g. label L2 for destination 128.2), ingress nodes A and B can stack the appropriate label (i.e. a table lookup is performed for the next hop and the associated FEC with the assigned label).

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing

date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prieto, B. whose telephone number is (571) 272-3902. The Examiner can normally be reached on Monday-Friday from 6:00 to 3:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's Supervisor, Jack B. Harvey can be reached on (571) 272-3896. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3800/4700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system, status information for published application may be obtained from either Private or Public PAIR, for unpublished application Private PAIR only (see http://pair-direct.uspto.gov or the Electronic Business Center at 866-217-9197 (toll-free).

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
P.O. Box 1450
Alexandria, VA 22313-1450

or faxed to the Central Fax Office:

(703) 872-9306, for Official communications and entry;

Or Telephone:

(703) 306-5631 for TC 2100 Customer Service Office.

BEATRIZ PRIETO
PRIMARY EXAMINER

B. Prieto
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May 28, 2005